Chapter 11

Valid Data Requirements

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1.0 Introduction

Data validation procedures are necessary to ensure the quality of pollutant and meteorological data submitted through the State of Indiana to the National Aerometric Data Bank (NADB). Using the following procedures ensures that the data submitted is complete, precise, accurate, and representative.

2.0 Valid Data Return

Before data can be used for any purpose such as modeling, attainment/non-attainment classification, etc., it must meet Valid Data Return (VDR) requirements. VDR requirements provide a measure of assurance that the data is statistically complete and representative.

For continuous data to meet VDR requirements, the amount of available valid data must be at least 75 percent (75%) of the total data possible. In addition, the valid data must meet certain distribution requirements as outlined in Table 1.

For intermittent data to meet VDR requirements, the amount of available valid data must be at least 75 percent (75%) of the total data possible. Also, the valid data must meet certain distribution requirements as outlined in Table 2.

The Indiana Department of Environmental Management, Office of Air Quality, Quality Assurance Section (IDEM, OAQ, QAS) must be contacted and provided with information needed to decide appropriate VDR requirements or sampling intervals other than those listed in Table 2 on Page 6.

3.0 Continuous Monitoring Data

For all continuous monitoring data, there are ten (10) basic causes for invalidation of monitoring data by either the monitor operator or quality assurance personnel. Data is considered invalid and not usable for any purpose if any of the following conditions exist:

1. The monitor records less than forty-five (45) minutes for any hour. However, there is one exception to this rule. If an hour contains the daily zero/span sequence, then only thirty (30) minutes of recorded data is needed for the hour to be valid. Also, the hour is invalid if the data integrator records or prints the data any time other than on the hour.

2. The monitor exhibits excessive zero or span drift. The daily zero and span values shall not exceed the maximum amount for a twenty-four (24) hour period. See Table 3 for the zero and span drift limits.

3. If all necessary identifying information is not on the raw data. The following must be present on the start and finish of each raw data segment:

   Site name
   Pollutant(s) or Meteorological Parameter(s)
   Date
   Time
   Chart speed
   Initials of operator
   Any remarks, such as paper jammed, pen up, etc., that will provide information concerning invalid or missing data

4. Evidence of any malfunction that affects the data is evident. The malfunction may be detected at any stage of the data handling procedure. Malfunctions may be with the monitor, such as low sample flow, low service gas flow, pump burnout, lamp burnout, etc.; or with the recorder, such as paper jam, improper chart speed, pen not inking, chart damage, faded trace, etc.

5. The monitor was not calibrated after on-site installation. The data is invalid until it is calibrated.

6. More than six (6) months have elapsed since the last continuous monitor's calibration or four (4) months for seasonal monitors, and one year for TEOMS (Tapered Element Oscillating Micro-Balance monitors). For meteorological parameters, refer to Chapter 9 of this manual. (See 10 below.)

7. If the value for the zero or span exceeds the range of the recording device, i.e., if the zero is less than 0.0% or the span is greater than 100.0%, then that data is invalid until the next zero or span that is within acceptable limits.

8. If the monitor exhibits excessive spiking or signal noise.

9. If the zero or span potentiometer is changed between calibrations with no documentation of a two-point calibration, all data is invalid from the time of the change to the time the monitor is properly recalibrated.

10. Also, the Quality Assurance Section Chief may invalidate continuous monitoring data for reasons not specifically noted in this chapter if the data or the collection procedures are of a questionable or improper nature. The Quality Assurance Section Chief will make decisions about these invalidations on a case by case basis.

4.0 Intermittent Sampling Data

For PM_{10}, TSP, Pb, $PM_{2.5}$, and toxics sampling data, there are eleven (11) reasons for invalidating data by either the sampler operator or quality assurance personnel. Data is considered invalid for any purpose if any of the following conditions exist:

1. The total sampling time is not within the range of 1,380.0 minutes to 1,500.0 minutes (23 to 25 hours).

2. Evidence of a malfunction is detected in any post-sampling check. Examples of malfunctions are:

    a. Particulate bleed-off
    b. Filters that have more than 9.0 mm^2 missing, more than 10 insects or insect parts on the filter, bird feces, etc.
    c. Burned out motor

3. All necessary information is not recorded for each sample. The following information must be available for each sample:

    a. Site
    b. Pollutant
    c. Date and time started
    d. Date and time ended
    e. Sampler motor number (and flow controller serial number, if applicable)
    f. Filter number
    g. Flow meter reading (if applicable) for start and finish
    h. Elapsed time meter reading for start and finish
    i. Any remarks
    j. Operator's signature (<u>not</u> <u>initials</u>)

4. The sample is collected on the same side of the filter as the filter number (smooth side). The filter has a rougher texture on one side to improve collection efficiency.

5. The orifice being used for calibrations has not been certified within the twelve (12) preceding months. All sampler motor calibrations done with an orifice that exceeds recertification requirements are invalid, and all data is invalid until the sampler is recalibrated using a properly certified orifice. (See QA Section Chief for exceptions.)

6. The sampler has not been properly calibrated within the three (3) preceding months. All data is invalid until the sampler is recalibrated using a properly certified orifice. (See QA Section

Chief for exceptions.)

7. An audit shows the sampler to be out of the calibration limits of ± 7.0%.

8. The sampler is calibrated using either an incorrect method or data (ex. temperature, pressure, orifice certification information). In these cases, the calibration is invalid and all data is invalidated until the sampler is properly recalibrated.

9. The initial and/or final flow rate at standard conditions for TSP and Pb and actual conditions for PM_{10} is not within the range of (1.1 m^3/min to 1.7 m^3/min for TSP and Pb or 1.02 m^3/min to 1.24 m^3/min for PM_{10}) the data may also be invalidated.

10. The difference between initial and final flow meter readings is not within the range of plus or minus (±) 10.0% data may be invalidated.

Also, the Quality Assurance Section Chief may invalidate intermittent monitoring data for reasons not specifically noted in this chapter if the data or the collection procedures are of a questionable or improper nature. The Quality Assurance Section Chief will decide these invalidations on a case by case basis.

The specific data validation limits for $PM_{2.5}$ and TEOM are detailed in Chapter 7, "Measurement of Suspended Particulates" of the Quality Assurance Manual. Validation of measurement data requires two stages, one measurement value level, and the second as the batch level. Records of all invalid samples are filed. Information contained in the record should include a brief summary of why the sample was invalidated. See Tables 4 and 5 of this Chapter.

The specific data validation limit for toxic monitoring is detailed in Chapter 8, "Quality Assurance of Ambient Air Toxic Organic Compounds Monitoring", of the Quality Assurance Manual. On a monthly basis, Quality Assurance staff members will randomly select an hour period to quality assure air canister and PAMS ozone precursors data by reprocessing the data file. Differences of 20 ppbC for a particular hour will be invalidated. Also, if such difference(s) are found, reprocessing will be required of the previous 12 hours and the following 12 hours of the selected 24 hour period to confirm accuracy. This will then total 48 hours of reprocessed data. If any 20 ppbC discrepancies are found again, appropriate hourly data will be invalidated. Reprocessing of 12 more hours prior to and following the previously reprocessed 48 hour period will be required, and so on, until no more discrepancies are found. Also, if any values higher than 300% of background are detected for a certain hour, that hour will be reprocessed to make sure it's valid. See Chapter 8, Part 8.0, Data Validation of Appendix G for the detailed technical procedure on data validation.

The Quality Assurance Section Chief will make a validity determination on data that is suspect, but does not adhere to the invalidation guidelines. Sample data may be invalidated for lack of completeness or representativeness, and will be invalidated for the major criteria listed below.

5.0 Data Classification

All ambient air monitoring data is classified into three different categories according to its representativeness.

5.1 Continuous Data

a. Category A. Data that is within ± 7.5% of the nominal value,
b. Category B. Data that is within ± 7.5% to ± 15.0% of the nominal value, and
c. Category C. Data that is beyond ± 15.0% of the nominal value.

A level one check (70-90% of analyzer range) detects how much a continuous sampler is out of tolerance.

Any data > than ± 15% for continuous samplers and ± 7.0% for intermittent samplers is considered "invalid".

5.2 Intermittent Data

a. Category A. Data that is within ±5.0% of the nominal value,
b. Category B. Data that is within ±5.0% to ±7.0% of the nominal value, and
c. Category C. Data that is beyond ±7.0% of the nominal value.

For intermittent samplers, any flow during the run date which deviates from (1.1 to 1.7 m^3/min at SRC for TSP or Pb) and (1.02 to 1.24 m^3/min at actual conditions for PM_{10}) is considered out of tolerance.

Table 1
VDR Requirements

Time Interval	Minimum Number of Valid Observations
Hour	At least forty-five (45) minutes*
Day	At least eighteen (18) hours
Month	At least twenty-one (21) days
Quarter	Three (3) months
Year	At least nine (9) months
Three-Hour Running Average	Three (3) consecutive hours
Eight-Hour Running Average	Six (6) hours out of eight (8) consecutive hours

*If an hour includes the daily zero/span sequence, the hour is considered valid if at least fifty percent (50.0%) of the hour is valid.

Table 2
Six Day Sampling Schedule

Time Interval	Minimum Number of Valid Observations
Quarter	At least twelve (12) samples
Year	At least forty-six (46) samples

Daily Sampling Schedule

Time Interval	Minimum Number of Valid Observations
Quarter	At least sixty-eight (68) samples/quarter
Year	At least two-hundred seventy-four (274) samples

Table 3
Zero and Span Drift Limits

Pollutant	Zero Drift Limit	Span Drift Limit
Sulfur Dioxide	4.0% of Chart (.5 ppm range) 2.0% of Chart (1 ppm range)	5.0% of Analyzer Range
Ozone	2.0% of Chart	5.0% of Analyzer Range
Carbon Monoxide	2.0% of Chart	5.0% of Analyzer Range
Nitrogen Dioxide	2.0% of Chart	5.0% of Analyzer Range

Table 4
Single Flag Invalidation Criteria for Single Samples

Requirement	Flag	Comment
Contamination	CON	Concurrence with lab staff and section chief
Filter Damage	DAM	Concurrence with lab and field staff
Event	EVT	Exceptional, known field event expected to have affected sample. Concurrence with lab and field staff
Lab Accident	LAC	Concurrence with lab staff and section chief
Field Accident	FAC	Concurrence with field staff and monitoring and quality assurance section chiefs
Flow Rate Cutoff	FVL	Termination of sample collection due to flow rate > 10% design flow rate for 60 seconds

Table 5
Single Sample Validation

Requirement	Acceptance Criteria	Major[1]	Minor[2]	Flag
Flow Rate	≤ ± 5% of 16.67 L/min for < 5 min	>10%	>5%	FLR
Flow Rate Verification	≤ 4% of transfer standard	> 6%	> 4%	FLV
Filter Temp	> 5º C for < 30 min	> 10ºC	> 5º C	FLT
Elapsed Sample Time	> 1380* or <1500 minutes	>1530	>1500	EST
Holding Times				
Pre-sampling	≤ 30 days	>32 days	>30 days	HTE
Sample Recovery	≤ 96 hours	>100 hours	>96 hours	"
Post-sampling				
25° C	≤ 10 days	>12 days	>10 days	"
4° C	≤ 30 days	>32 days	>30 days	"

* sample will still be used with sample period calculated with a time of 1440 minutes and flagged.
[1] if 2 majors occur; data invalidated.
[2] if 4 minors occur; data invalidated. 2 minors equal 1 major.